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Bibliography Of Space Books And Articles From Non-Aerospace Journals

1957-1977

History Office
NASA Headquarters
Washington, DC 20546

1979

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BIBLIOGRAPHY OF SPACE BOOKS AND ARTICLES FROM NON-AEROSPACE JOURNALS

1957-1977

John J. Looney

History Office
NASA Headquarters
Washington, DC 20546

1979

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INTRODUCTION

This bibliography has been compiled with the intent of filling a perceived gap in the coverage of NASA and its concerns provided by existing bibliographies. At first glance, this will seem preposterous. NASA's Scientific and Technical Aerospace Reports (STAR) and International Aerospace Abstracts cover some 64,000 books, papers, reports, and articles a year. NASA's computerized data-base makes a sophisticated search of this material both easy and quick. Certainly for aerospace journals, conference proceedings, trade publications, and a wide range of government and aerospace industry books, papers, and reports with technical themes, coverage is already more or less complete. For the purposes of this work, this body of material is defined as specialized literature. For the somewhat less technical articles published in non-aerospace scientific and technical journals, and for the decidedly non-technical books and articles on aerospace-related themes that appear occasionally in the literature of the humanities and social sciences, there is no similarly complete coverage. This bibliography is a first stab at pulling together the non-specialized, secondary literature relating to NASA in particular and spaceflight more generally.

Once the existence of a gap in the bibliographical coverage is admitted, the next question to arise is, who cares? Are we really missing anything important, or simply ignoring rehashings of existing material, watered down to give the layman a fighting chance of making sense of it? Two comments are in order here. First, non-specialized literature, as it is defined here, can in fact be highly technical. For information on how a spacecraft was constructed, an article in The Welding Journal may be more useful than one in The Journal of Spacecraft and Rockets, since the former can assume a greater familiarity with manufacturing techniques among its readership. Similarly, one would look to The American Bar Association Journal rather than The AIAA Journal for an analysis of the Outer Space Treaty of 1967. Non-specialized is not the same as non-technical.

Of course, much of the literature in this bibliography is not technical in any sense; and the second comment is that non-technical is not synonymous with trashy. The historian of technology is always faced with a problem in presenting his results. To what audience should he direct his efforts? If he aims at too select a group, those most directly concerned with his topic may like his work, but no one else will read it. If he aims at a wider group, critical derision will not be compensated by any significant rise in lay knowledge. The non-technical authors cited in this work seem to have struck a difficult balance between esoteric complexity and jargon on the one hand and superficial oversimplification on the other.

READEX FICHE

How This Bibliography Was Made

Users of this bibliography will quickly discern both chronological and categorical disproportions in its coverage. This is partly owing to the nature of the literature being sampled, partly to the tools used in sampling it, and partly to the character of the compiler.

The literature itself appears to be chronologically biased toward the pre-1970 period. There are two reasons for this. For social science literature, it can perhaps be assumed that the interest of its readership, like that of the public as a whole, peaked with the manned lunar landings and declined quickly thereafter. No doubt this was reflected in its coverage, indirectly as well as directly, since declining economic and political impact meant that there was less to write about. In the case of scientific and technical journals in areas outside aerospace, the argument of declining interest might also hold, though to a lesser degree. But, in addition, it would seem that there was less being published in non-aerospace journals. An increasing sense of identity as a space scientist, rather than a physicist engaged in space research, would be reflected when deciding where to publish. This would be coupled to the declining novelty of spaceflight. In the early 1960s, articles about every aspect of astronautics appeared in non-specialized journals. A decade later this was old hat, and there was less need to publish anything but highly technical works directly relevant to the discipline involved.

A second disproportion induced by the literature is in subject matter. This is mainly true of social science literature, which is numerically dominated by material on space law and satellite communications. The latter is hardly surprising since, until fairly recently, in terms of economic, legal, and international impact, satellite communications was far and away the most important product of the space age. Recently, of course, remote sensing has begun to challenge this preeminence and is gradually appearing in the literature.

The case of space law is less easily explained. As one leafs through articles on criminal jurisdiction in space and on metalaw (the law that determines the just treatment of sentient aliens), it is easy to ask, just what does a practicing space lawyer do? The profusion of the literature certainly seems unaccompanied by any equivalent increase in space litigation. The answer is partly a laudable urge to nail down agreement on possible sources of conflict before they arise, and partly, perhaps, the inevitable consequence of several universities' adding space lawyers to their faculties.

The tools used in compiling this bibliography have also had their effect. Five basic means of obtaining references were used. First, a variety of abstracts and indexes were consulted. These comprised International

Political Science Abstracts, Sociological Abstracts, Economic Abstracts, Psychological Abstracts, Applied Science and Technology Index, Environment Index, and Business Periodicals Index. The problem that arose in using the various social science abstracts came in discovering what subject tracings (i.e., key words) were used for relevant articles. It was usually not enough to look under "space," since to students of psychology or economics this would have only the most peripheral relevance. Besides, in earlier years "outer space" and "cosmic space" were used just as frequently, and the switch from one to another usually took place without warning. The most helpful tracings varied with the subject matter of the index. Thus, in the Psychological Abstracts, "simulation" and "aviation medicine" were helpful tracings, while, in the International Political Science Abstracts, these terms turned out to be useless, with "space law" and "INTELSAT" proving to be particularly helpful. The suspicion always remains that many relevant articles were abstracted but not located, since their importance to political scientists and sociologists does not lie in their relevance to space, leaving little reason to trace them accordingly.

The Applied Science and Technology Index (ASTI) was used for access to non-specialized scientific and technical literature. The main difficulty in using the ASTI is its format, which is similar to that of the Readers' Guide to Periodical Literature. Like the Readers' Guide, within the subject headings one has only the title to go on, and, also like the Readers' Guide, every article in a journal, including one paragraph news briefs, is listed. Under the circumstances, it is difficult to separate the wheat from the chaff. The scope of this project did not run to tracking down every article to assess its contents; instead it was decided that a wide net would be cast, on the assumption that the future researcher would be able to decide which articles looked promising much more efficiently than this compiler. Relevant articles were excluded only if the compiler, by a highly subjective process, ruled them out as too technical. The real issue was not technicality per se, but technicality in non-aerospace fields. Thus, an article telling about a given satellite's auxiliary power system would be included, but not one about contributions of satellite meteorology to understanding cloud patterns in the Black Sea. Both are technical, but the former was regarded as more directly relevant to the space historian. The ruling on technicality also varied with the journal in question. Articles in certain journals, aimed at a wide audience of scientists, were treated more favorably than those more narrowly oriented. A title that was included if it appeared in Science or IEEE Spectrum might be excluded if it appeared in Journal of Applied Meteorology or one of the IEEE Transactions series. Taken as a whole, these rules have an air of both arbitrariness and vagueness. They require placing a faith in the compiler that is certainly unwarranted. The main justification is that no claim of complete coverage is being made. Regarding the ASTI, such a claim would be foolish in any event, since its journal coverage varies widely over the 20 years in question. Journals are dropped and added with bewildering frequency and with no warning. This bibliography's coverage of the ASTI, then, is meant not to provide access to every relevant article in every non-aerospace scientific and technical journal, but to provide a solid sampling of what this literature has to offer to a historian studying any given space problem.

After the abstracts, several bibliographies were used. Among these were Irvin White et al., Law and Politics in Outer Space: A Bibliography (1972), the Aspen Institute's Humanistic Aspects of Space Exploration: Annotated Bibliography (1970), and the annual bibliographies in Technology and Culture and Isis. White's massive bibliography, which the compiler raided shamelessly and to which he owes a great debt, could in fact be the real explanation of any disproportion in this bibliography's coverage of space law. On the other hand, the existence of such a bibliography as White's is surely not independent of the literature in the field. If the economics of space had as massive a literature as does space law, it would quite likely have its own bibliography as well. The bibliographies in Technology and Culture and Isis were most useful for the literature on the origins of rocketry and theories of space travel. By browsing through their pages, one can gauge which topics are now "safe" for historians of science and technology and which are still too new.

A third research tool used regularly was stackwork, obtaining a book or series of books and raiding their footnotes and bibliographies. This was necessary to fill gaps in the coverage provided by abstracts and bibliographies. Unfortunately there was only time to do this extensively in the fields of telecommunications and space law. Again, there is both cause and effect in the results of this choice as to any disproportions in coverage.

The fourth tool was what one might call serendipity. Sometimes while searching, particularly in the card catalogue, for an item, something else of relevance came to light and was included. This most commonly involved other works by a given author. Since it was not always necessary to go to the card catalogue, some prolific authors are covered much more completely than others, due to chance rather than intent.

Finally, several periodicals were searched volume by volume from 1958 to the present. The titles in question usually had a low proportion of relevant articles, but were regarded for one reason or another as sufficiently important that any relevant article that appeared would be of unusual interest. The titles searched in this manner were Technology and Culture, Isis, Technology Review, Minerva, Aerospace Historian (formerly Air Power Historian), Social Studies of Science (formerly Science Studies), Bulletin of the Atomic Scientists, and Current History.

The third source of disproportionate coverage in this bibliography is the least easily analyzed, particularly by the compiler. Compiler bias falls into two categories; research decisions and prejudices. Four major decisions cut down the number of references compiled. Each decision removed a major body of literature from this work, and this may prove to be an inconvenience to those who use it. On the other some restriction was necessary if this project was to be the work of a summer, rather than a lifetime.

First, everything in a foreign language was excluded, both to reduce the project's scope and to avoid straining the compiler's limited linguistic resources. Second, nothing from specialized aerospace periodicals was included. The major journals excluded were Astronautics and Aeronautics, Journal of Spacecraft and Rockets, Space/Aeronautics, AIAA Journal, Journal of Space Law, Aerospace Medicine, and Photogrammatic Engineering and Remote Sensing. These were excluded on the grounds that a serious student of space would probably already have a feel for what they do and do not contain and because they are already adequately covered by existing bibliographical tools. Also excluded were a variety of technical reports that appeared in Psychological Abstracts and were, on the whole, concerned with topics in aerospace medicine, such as USN AMI NASA Joint Reports, USAF AMRL Technical Reports, USAF WADD Technical Notes, and USN SAM and NASA Joint Research Reports. These were excluded as too technical, too specialized, and not obviously non-military.

Third, articles of less than three pages were usually excluded. It is to be hoped that, in a rough and ready way, this excluded many of the news briefs without seriously cutting into the numbers of relevant analytical articles. Of course, some two page editorials will be worth far more than ten pages of photos of a satellite with "Look Ma! I'm orbiting!" captions. On the other hand, the researcher might prefer to pass up the occasional important two-page article if he can thereby reduce this bibliography, and the time required to search it, by a third.

Fourth, literature on aeronautics was, on the whole, excluded. This was certainly not meant to express any opinion as to the relative worth of aeronautics and astronautics within NASA or without. The decision was based entirely on time constraints. Subject headings of the two were usually distinct, and since both areas have a huge literature, the amount of searching would have been doubled. More importantly, NASA has a much larger proportion of the governmental presence in space than in the air. Almost any article on space is potentially of interest to the NASA historian, but an article on aeronautics may be far more important to the student of the FAA, the CAB, or the U.S. Air Force. The compiler, lacking both the time and the specialized knowledge which might have made it possible to sort out the literature most relevant to NASA, chose instead to concentrate his attention on space, which seemed to offer less scope for error.

It should be noted that of these four rules, only that barring foreign language references was followed rigorously. A few articles from specialized periodicals were included, either because they were obtained before the decision to exclude them was formulated or because they impressed the compiler as peculiarly relevant to the historian. Short articles were included if their titles suggested that they were editorial in nature, particularly if they were in journals addressed to the whole scientific community, such as Science and Bulletin of the Atomic Scientists. Articles on aeronautics were included when they were encountered, but no special effort was made to search for them. In all three areas, inclusion is highly haphazard and to be regarded in no way as comprehensive.

The compiler cannot, of course, be expected to set down his own prejudices with complete detachment. However, three warnings are in order. First, it must be remembered that he lacks any kind of specialized technical training. He was hired as an experienced bibliographical searcher with a history degree, which is fine as far as it goes. But his degree is in 18th century English history, and his ignorance of things technical, which is almost complete, must sometimes have manifested itself in strange ways. This would be particularly true when trying to decide if an article was "too" technical. For example, many articles on communications satellite systems were included since the compiler thought "system" sounded nice and broad. Yet when he looked at several such articles they were as technical as others that he had excluded.

A second prejudice was noted while working with the ASTI. The number of references selected from this source was seen to increase dramatically as the compiler worked through twenty years of coverage. This seems to have been caused not by an increase in the number of relevant articles so much as by increasing facility on the compiler's part in arguing himself into including borderline cases. It took several weeks to get through the ASTI, and as day followed day new ways in which articles might prove relevant to the researcher continually occurred to the compiler, with the standards for inclusion being relaxed accordingly. To some extent this was remedied by redoing the first three years searched after the search through the ASTI was complete. But, no doubt, a disproportion still remains even for the ASTI, and the problem would apply to other stages of the compilation in any event.

Related to this is the "I've-found-nothing-in-an-hour--I'll-take-anything!" phenomenon. When the compiler was working a rich lode of obviously relevant material his standards for inclusion were stricter than when only a few borderline titles were turning up. Since this is probably true of anyone putting together a bibliography, the compiler is not particularly apologetic.

The researcher who has plowed through this dismal catalogue of errors of omission and commission, exclusion and profusion, may lose heart before actually using the work it introduces. Two words of encouragement come to mind. First, a bibliography, unlike a book or an article, expresses a viewpoint only indirectly, by what it does and does not include. Hence, it is never a total loss. It can always be salvaged by supplementation, either by another compiler or by the researcher. Second, even the compiler, though no specialist in space history, was excited by the diversity and quality of the extant secondary literature. It would be a shame if any researcher chose to ignore it. Whether by this tool or by another, the researcher should by exhorted to see what it has to offer.

How to Use This Bibliography

References are arranged by topic, and, within each topic, alphabetically by author. It is the compiler's fondest hope that the topics are, on the whole, self-explanatory. However, a few comments may be helpful.

With a handful of exceptions, citations appear only once. Those that could fall in more than one topic or that hang on the borderline between two topics have been arbitrarily placed in a single category. This has the advantage of reducing the bulk of the bibliography, and the disadvantage of forcing the researcher of a borderline subject to search through the entries under all of the relevant topics. The student of the Gemini project will have no choice but to cull relevant entries from topics 5 (boosters and rockets), 6 (technology of spaceflight), and 7 (manned flight). Even this will be inadequate, since several other topics are of more than peripheral relevance.

An effort was made to alleviate this problem by establishing priorities in the choice of topics for borderline titles. The decision that articles on the law of satellite communications would go under the topic of communications applications of space rather than space law is, of course, arbitrary, but it is superior to putting half of the articles under each topic as the whim moves the compiler. When the decision is made in advance, the compiler can at least impart to the researcher how he has chosen to be arbitrary. Fortunately, it was not necessary to work out a priority for every combination of topics. Only a few overlapped more than once or twice. Six decisions accounted for the great majority of the borderline cases.

First, any reference that dealt with the pre-1958 period went into topic 2 (origins of spaceflight). Of course, everything under this topic could go somewhere else: articles on Tsiolkovsky under 12 (foreign space programs), references to Robert Goddard under 5 (boosters and rockets), etc. Thus, the viability of 2 as a separate topic depends on the recognition of a qualitative difference between pre- and post-Sputnik rocketry and theory of spaceflight.

Second, topic 7 (manned spaceflight) requires some explanation. Many of the titles in topic 7 are clearly relevant to topic 6 (technology of spaceflight) or topic 8B (space medicine). The basic dividing line between 6 and 7 is that titles on engineering for life support, comfort, and activity (examples would include material on the development of the spacesuit, the maintenance of a breathable atmosphere in spacecraft, or the design of portable lighting for Skylab) were included under topic 7. But articles on, for example, tracking or auxiliary power systems of manned vehicles were included under topic 6, on the assumption that they were not basically dissimilar from treatments of the same theme with respect to unmanned vehicles. The interface between topics 7 and 8B came in simulations of the effects of outer space activity on astronauts. If the simulation was primarily concerned with how the simulated activity would affect an astronaut's health it went into topic 8B, but if the emphasis was on how his in-flight performance would be affected, it was placed it topic 7.

Third, a category for science policy (8C) was created. Quite a few titles were concerned not so much with describing experiments and reporting their results as with the proper priorities in the allocation of scientific resources. These titles seemed as relevant to public policy and opinion (13) as to space science as originally, narrowly, defined. So 8C was set up to hold titles that deal with science policy. A number of titles on U.S. science policy in general also appear in 8C, but their selection was haphazard and should be regarded as introductory rather than comprehensive.

Fourth, references that explored the political and legal implications of applications of space technology were classed under the appropriate application. Articles on the international politics of satellite communications went under 9B (communication applications) and articles on the legality of remote sensing went under 9C (remote sensing).

Fifth, the topic of space law (10) was restricted by and large to general treatments. When a choice seemed possible, a title was placed in some other topic. Thus, articles that explained the implications of space treaties went under 11A (international organizations and agreements), and those on remote sensing and telecommunications went under 9. This was prompted by the huge number of titles relevant to space law, and the need to break them down further. The student of remote sensing who wants to learn a little about its legal implications might give up if he had to plow through 500 or more titles, of which less than a dozen may be of any relevance. As it stands, topic 10 contains numerous general treatments of space law and some discussions of points of law that seemed to fit in no other category, such as criminal jurisdiction in space and metalaw.

Finally, topics 11C (international programs and projects) and 12 (foreign space programs) were broadly defined to include articles relevant to 6 (technology of spaceflight), 8 (space science), 9 (applications), etc. This was another decision prompted by comparative numbers of titles. The student of the U.S.-Canadian topside sounder experiments should not have to look through every title in 8A for material on the data those experiments yielded, and neither should it be necessary for the student of Soviet astronautics to search all of topic 6 to obtain the handful of titles on Soviet space technology. In this case, there seemed a clear advantage in choosing one direction in which to discriminate over the other.

Overall, the researcher with any doubts is urged to check every potentially relevant category. Though the table of contents will at least make it possible to eliminate searching the majority of the topics for material on any given subject, the need to search more than one will surely be the rule rather than the exception. Given that the topics chosen tend to shade imperceptibly into each other and that this would be true of any choice of rubrics, it would be foolish to hope for more.

This work, as printed, contains only bibliographical information on a collection of titles, arranged by author within subject headings. It was decided early on that annotation would be sacrificed to more complete coverage. However, the researcher with easy access to the NASA History Office may want to know that the 3x5 cards upon which the data was recorded (and which the History Office retains), frequently contain a brief annotation on the back. When the compiler had a chance to look at either the work itself or an abstract or review of it, he usually wrote a brief description. This is true of a substantial number, though less than half, of the cards. Some other data is also on the cards but not in the bibliography in some or most instances, including the source from which the reference was obtained, and, for books, the number of pages. The following abbreviatons and symbols were used:

1. The lower right-hand corner of the reverse (the side opposite the author and title) gives the source from which the reference was obtained. When the footnotes or bibliography of a work were raided, its author(s) and, where necessary, the work's date, were written. The abbreviations used for abstracts, indices, and bibliographies are are follows.

    IPSA- *International Political Science Abstracts*
    SA - *Sociological Abstracts*
    PA - *Psychological Abstracts*
    EA - *Economic Abstracts*
    ASTI- *Applied Science and Technology Index*
    White-Irvin White et al, *Law and Politics in Outer Space: A Bibliography* (1972)
    Aspen-*Humanistic Aspects of Space Exploration: Annotated Bibliography* (1970)
    BPI - *Business Periodicals Index*
    ISIS- Reference is from either a review or this journal's annual bibliography
    T&C - Reference is from either a review or the annual bibliography in *Technology and Culture*.
    AIAA- Reference is from either the bibliographies of astronautical history in *Acta Astronautica* or the NASA History Office's unpublished "Readings of Note"

2. A check (✓) in the upper right-hand corner of the reverse means that the compiler saw the item listed on the card.

3. A solidus (/) in the lower left-hand corner of the reverse is relevant only to dissertations and means that the compiler located the title in question in Dissertation Abstracts.

4. The lower middle of the obverse (the side with the author and title) can have three items. The number(s) in pencil are the topic numbers. They have since been changed, so they should be ignored. A number in pen is the number of pages. A location (e.g., Cairo) is given for a few journals that have English titles but are published abroad.

5. Finally, the compiler occasionally repeated a word from the author or title in the lower left-hand corner of the obverse if he had doubts about the legibility of his handwriting, particularly in the case of names, where the spelling could not be inferred from context.

Abstracts, Indexes, Bibliographies, and Journals Searched for This Bibliography

1. *Acta Astronautica*, 1970-1973, bibliographies of astronautical history
2. *Aerospace Historian* 3-25 #2 (1956-June 1978, except Mar. 1976; formerly *Air Power Historian*)
3. *Applied Science and Technology Index* (1958-1977)
4. *Bulletin of the Atomic Scientists* (Oct. 1957-1977)
5. *Business Periodicals Index* (browsed)
6. *Current History* (1958-1977, except 1973)
7. *Economic Abstracts* (1957-1977; from 1976, title changed to *Key to Economic Science*)
8. *Environment Index* (1971-1977)
9. *Humanistic Aspects of Space Exploration: Annotated Bibliography* (1970)
10. *International Political Science Abstracts* (1957-1977)
11. *Isis* 48-68 (1957-1977), except 59 (1968)
12. *Minerva* 1-15 #2 (1962-summer 1977)
13. *Psychological Abstracts* (1957-1977)
14. *Social Studies of Science* 1-6 (1971-1976; 1-4 as *Science Studies*)
15. *Sociological Abstracts* (1957-1977)
16. *Technology and Culture* 2-19 #2 (1961- Apr. 1978)
17. *Technology Review* 60-68 #2 (Nov. 1957-Dec. 1977)
18. White, Irvin, et al. *Law and Politics in Outer Space: A Bibliography* (1972)

1A. Space Activity: General

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9C. Applications: Remote Sensing

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U.S. GOVERNMENT PRINTING OFFICE : 1980—307-772/1204